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THE STERILAMP IN THE HOSPITAL

In the early days of the Duke Hospital, despite every precaution, we had an occasional wound infection and it was impossible to eliminate these by any of the usual precautions in our surgical technique. After much preliminary work and attempting to eliminate these infections, it was found that the *Staphylococcus aureus*, which caused over 90 per cent of the infections, was regularly present in the air.

We then demonstrated that the outside air was practically free of pathogenic bacteria; that the air after being washed and filtered was free of all organisms but that the air leaving the operating room was highly contaminated. After painting and scrubbing the operating rooms to get them free of organisms it was determined that they were rapidly re-contaminated by the entrance of human beings and that any of the rooms after being closed for 24 to 48 hours were practically free of bacteria, even though fans were used to stir up any dust that might have settled.

Since we could not keep the operating room free of bacteria, we turned to radiation of known bactericidal properties in an attempt to sterilize the air. It was shown that we could kill various types of bacteria within a very short period of time at a distance of five feet from the source of radiation. It was then shown that we could reduce the bacterial content of the air at the operative site to a very low level by this radiation.

Before operating on patients under the radiation, the more susceptible human beings had their skin exposed for as long as 1 1/2 hours, five feet from the

Excerpts from a paper delivered by Dr. Deryl ■ Hart, Surgeon-in-Chief of Duke Hospital, at a meeting of the American Institute of the City of New York in Engineers' Hall, New York, March 7, 1938.

radiation, without burns. We carried out numbers of animal experimentations and healing of the skin, the subcutaneous fat and the muscles seemed to be better when the radiation was used than when it was not used. There seemed to be no increase in peritoneal adhesions following exposure of the peritoneum to the radiation for as long as one hour.

Petri dishes of blood agar were sprayed with various organisms and exposed to the radiation of the intensity used for operating, and these could be killed at the operative site within from one to three minutes of exposure. Some of the fungi were more resistant but most of these were killed within from 5 to 20 minutes exposure.

Due to the fact that some said that the bacteria in the air was a local condition with us, various hospitals throughout the country cooperated by exposing plates in their operating rooms. It was found that the Staphylococci were universally present and one of the most common organisms in the operating room and that *Staphylococcus aureus* is frequently present in large numbers. These studies also showed that the air conditioned operating rooms had a much lower bacterial content than non-air conditioned rooms. This was thought to be due to the elimination of the non-pathogenic organisms from the incoming air and more efficient removal of the organisms given off by the individuals, by the ventilating system.

From a total of 10,050 operations, over 800 have been performed in a field of sterilized air. These have been only cases of greater magnitude and relatively clean cases. Of the 800 operations 400 can be classed as definitely clean cases. With the use of this radiation we have reduced the number of infections in clean wounds from 4 per cent to less than one-half of one per cent.

In extrapleural thoracoplasties for pulmonary tuberculosis, infections in primary incisions have been reduced to 1/12 of the pre-existing level and in secondary operations to 1/3 of the pre-existing level.

The mortality in operations for thoracoplasties was reduced from 5.5 per cent to 2.9 per cent with the use of bactericidal radiation, this reduction being

accounted for by the elimination of deaths from wound infection. The number of infections following radical mastectomies was reduced from 31 per cent to 2.6 per cent. Infections in inguinal herniorrhaphies were reduced from 3.3 per cent to 0 per cent.

Equally as striking as the reduction in the number of infections and the eliminations of deaths from infections, and probably of more importance in our operative results, has been the reduction in the reaction in the wound and the general systemic reaction of the patient. By the use of the radiation the number of patients running a temperature higher than 38 degrees Centigrade (100.4 degrees Fahrenheit) has been reduced as follows: Thoracoplasties from 68 per cent to 30 per cent; radical Mastectomies from 46 per cent to 34 per cent; inguinal Herniorrhaphies from 36 per cent to 22 per cent.

More striking than the reduction in the elevation of the temperature has been the reduction in the duration of temperature following operation. The number of patients running a temperature for more than four days following operation has been reduced by the use of bactericidal radiation as follows: Thoracoplasties from 78 to 22 per cent; radical Mastectomies from 54 to 21 per cent; inguinal Herniorrhaphies from 46 to 14 per cent.

With this reduction in the systemic reaction, as shown by the temperature elevation and duration, there has been less reaction in the wound. There has been less pain and the patients have not appeared to be as sick following operation and convalescence has been hastened.

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